



SOUTHEAST ASPHALT USER PRODUCER GROUP
ANNUAL MEETING
NOVEMBER 9-11, 2009
HILTON HEAD, SC

CURRENT STATUS OF INDUSTRY WITH RESPECT TO HEALTH EFFECTS OF ASPHALT FUMES
by
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SCOPE OF PRESENTATION

1. SOME BACKGROUND INFORMATION
2. RECENT STUDIES THAT HAVE BEEN COMPLETED OR NEARING COMPLETION
3. SUMMARY OF WHAT THE FUTURE LOOKS LIKE

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BACKGROUND

1. In 1981 NIOSH (National Institute for Occupational Safety and Health) published results of a mouse skin painting study comparing the carcinogenicity of fumes from coal tar pitch and from a roofing asphalt.
 1. Overall conclusion was asphalt fume condensate not as cancerous as coal tar pitch volatiles, but did cause skin cancer in mice.
2. Led to a second NIOSH skin painting study published in December 1989, which looked just at asphalt fume condensate, again from Type III roofing asphalt, again generated at 316°C (600°F)
 1. Very in depth study which led again to the conclusion that asphalt fumes are carcinogenic in mouse skin painting assay
3. Appreciate that this one slide summarizes 350 pages of research reports

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BACKGROUND

1. Beginning in 1989 industry began to investigate the “why” behind these outcomes
 1. The cancer causing conclusion at odds with observational evidence
 2. Anecdotal observation is not conclusive evidence that there is not an underlying problem
2. Heritage Research Group led the laboratory research effort into understanding why NIOSH obtained the results they did.
 1. Method of fume generation deemed to be a key reason why the fumes generated by NIOSH were carcinogenic

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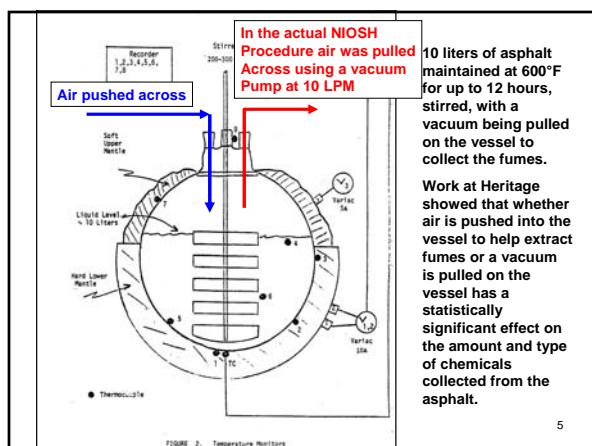



FIGURE 2. Temperature Monitor

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BACKGROUND

1. Further work by Heritage and others showed that if fumes are collected in the laboratory and in the field such that they match the composition of fumes that workers are actually exposed to that those fumes are not mutagenic
 1. Not being mutagenic does not necessarily mean non-carcenous
 2. Last piece of the puzzle—perform a skin painting test using fumes that model those to which workers are exposed
2. Asphalt does contain carcinogenic compounds generically termed polynuclear aromatic compounds (PAC's) or polynuclear aromatic hydrocarbons (PAH's)
 1. PAH's are a type of PAC, PAC's contain elements other than carbon and hydrogen (e.g. sulfur, nitrogen or oxygen)
3. Point 2 means that the potential is present for asphalt fumes to be carcinogenic, the question is do those compounds ever get to the worker

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RECENT RESEARCH


1. FRAUNHOFER RAT INHALATION STUDY of ASPHALT FUMES SPONSORED PRIMARILY BY EUROPEAN BITUMEN MANUFACTURERS AND PAVING COMMUNITY
2. IARC (INTERNATIONAL AGENCY for RESEARCH on CANCER) EPIDEMIOLOGY STUDY and FOLLOW UP NESTED CASE-CONTROL STUDY
3. ASPHALT INSTITUTE SPONSORED MOUSE SKIN PAINTING STUDY OF PAVING TYPE ASPHALT FUMES
4. NAPA SPONSORED STUDY OF RELATIVE IMPACT OF INHALATION EXPOSURE VERSUS DERMAL EXPOSURE IN PAVING WORKERS



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Objective: to clarify the potential health effects of prolonged inhalation exposure to 'fumes' from hot bitumen.

- Two year 'nose-only' inhalation study in rats
- Aerosol & vapour from a tank fume condensate
- Exposure atmosphere 'matched' to workplace fume
- Target concentrations: 0, 4, 20, 100 mg/m³ THC
 - 50 male and 50 female rats in each exposure group
- Study started March 2003. Finished March 2005

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Exposure Concentrations

	Total Hydrocarbon Concentration (THC) – mg/m ³		Particulate: Vapour (%)
	Mean Measured ^a	Mean Actual ^b	
Control	0	0	-
Low	4.1	6.8	15:85
Medium	20.7	34.4	27:73
High	103.9	172.5	50:50

a - measured by BIA method b - corrected using a factor of 1.66

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Conclusion

1. Exposure of rats by inhalation to bitumen fume (aerosol and vapour) for 2 years did not result in any statistically significant increases in total or organ-specific tumour incidence, compared to clean air 'control' and bitumen exposure groups. Based on these results bitumen fume is not considered to be carcinogenic to rats.
2. Bitumen-related irritant effects were observed in the nasal passages and in the lungs.
 1. Irritation effect was statistically significant in the highest dose group of rats

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RECENT RESEARCH-IARC report 01/003 Oct 2001


1. Epidemiology study of 29,820 male workers in road paving, asphalt mixing, waterproofing & roofing jobs in the European asphalt industry
2. Compared to a group of 32,245 individuals in construction industry but not exposed to bitumen fumes
3. Results suggested increase in lung cancer when workers exposed to bitumen fume are compared with the national population when:
 1. Increasing average exposure to bitumen fume
 2. But not in the case of increasing duration or cumulative

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RECENT RESEARCH


4. Further concluded that confounding from exposure to other agents could not be ruled out
5. Results do not allow to conclude on the presence or absence of a causal link between exposure to bitumen fume and lung cancer
 1. Recommended that a case control study of lung cancer be conducted.

- This study has detected a decrease in exposure to bitumen fume at an average rate of approximately 6% per year between 1970 and 1997.

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RECENT RESEARCH-IARC NCC final report July 1, 2009

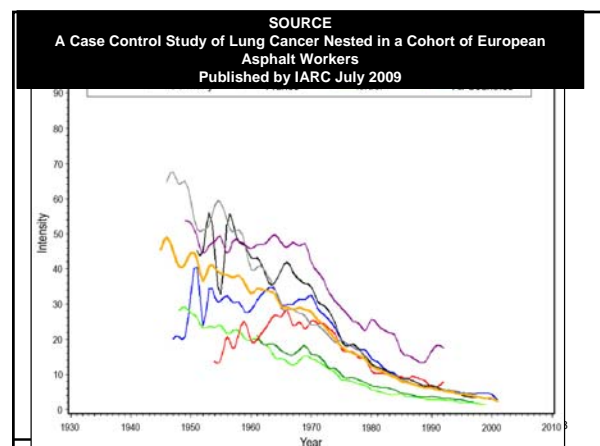
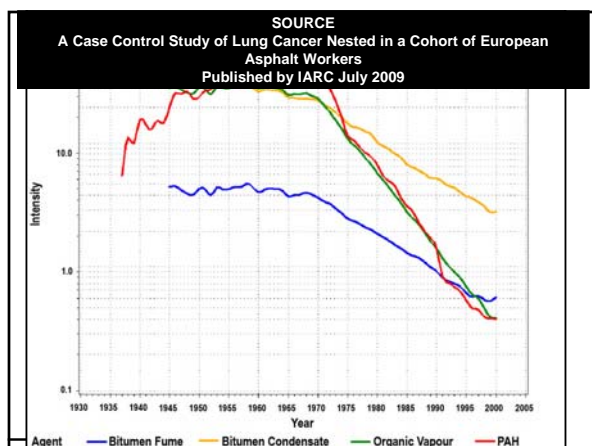
1. Case-Control study compares workers from original study who had cancer (all but 2% of cases were deceased) with living members of the original group. There was a ratio of 3 controls for each case
2. Extensive interviews of living cases, next of kin and fellow workers to obtain detailed working and exposure conditions of the cases
3. Estimates of exposure were derived for bitumen fume, organic vapor, bitumen derived PAH's, dermal exposure as well as exposure to silica, diesel exhaust and coal tar

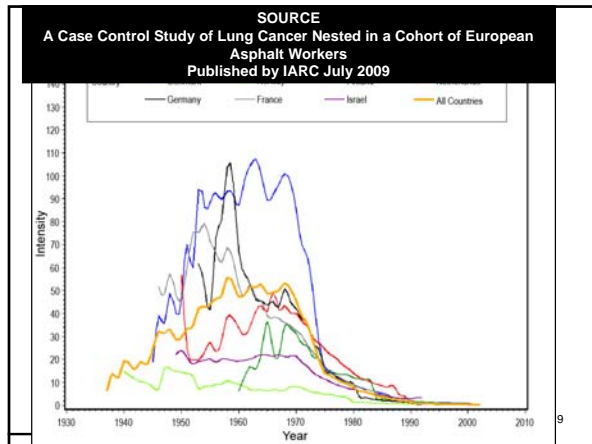
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RECENT RESEARCH

1. Two conclusions drawn from the study
 1. Sizeable proportion of excess mortality from lung cancer likely attributable to high consumption of tobacco and
 1. Possibly due to coal tar exposure
 2. Other occupational agents did not appear to play a role
 2. No consistent evidence of an association between indicators of inhalation or dermal exposure to bitumen and lung cancer risk.
 3. Further the report emphasized the importance of current trends in reducing inhalation and dermal exposure
 4. Assessment of dermal exposure may provide important information on agents which might penetrate skin and be systemically distributed

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MATHY TECHNOLOGY 20

RECENT RESEARCH

1. Study is completed but final report has not yet been published
2. Fumes from PG 64-22 were collected and carefully matched to the characteristics measured on workers using the same binder
3. Study was conducted by MPI, an independent research facility
4. The test fumes, a positive and negative control were painted on mice
5. Important step in light of earlier NIOSH skin painting results

MATHY TECHNOLOGY 21

RECENT RESEARCH

1. Results of skin painting showed no excess skin cancers in mouse skin compared to the control group that was only skin painted with the carrier solvent
2. Underpins the industry position that asphalt fumes to which workers are exposed is substantially different than those fumes generated by NIOSH under atypical conditions

MATHY TECHNOLOGY 22

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MATHY TECHNOLOGY 23

RECENT RESEARCH

1. Research is collaborative effort between NAPA, NIOSH, CDC, Harvard School Public Health, Heritage Research, Milestone Paving, E&B Paving, and Mathy Construction
2. Field work on this project has been completed
3. Data currently under analysis
4. Study prompted by recent studies appearing to show that dermal exposure of fume condensate could be more significant than inhalation
 1. Dr. Greim's summary at the conclusion of the Dresden Health Effects of Exposure to Emissions from Bitumen Symposium

MATHY TECHNOLOGY 24

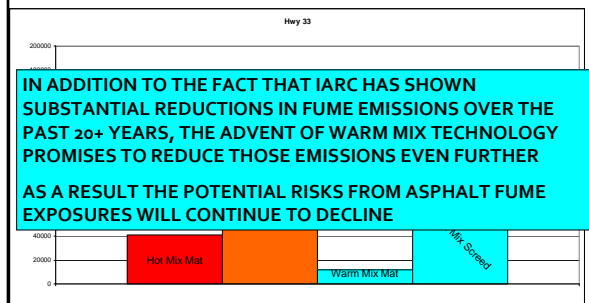
RECENT RESEARCH

5. Some new approaches to monitoring dermal exposure were developed by researchers
6. Inhalation exposure was measured
7. Urine samples were collected 3 times per day to ascertain dermal uptake of PAH's, a wide range of metabolites of PAH's were screened by CDC
8. Intervention studies conducted at 3 different paving locations
 1. Fresh air delivered to workers so that only dermal exposure was determined
 2. As nearly as possible skin was covered to prevent dermal exposure, and only inhalation was measured
 3. Diesel fuel was removed from clean up-biodiesel used

RECENT RESEARCH

9. While data is still being analyzed preliminary indications are
 1. Evidence of dermal uptake limited to 2, 3 and 4 ring PAH's-generally considered to be non-carcinogenic
 2. Diesel fuel used for clean up appears to be a significant contributor to dermal exposure either by itself or due to solvent effect on fume condensate or whole asphalt

MEASUREMENT OF TOTAL ORGANIC COMPOUNDS USING PORTABLE GC
COMPARISON BETWEEN PG 58-28 HMA & WMA



CONCLUSIONS

1. IARC WILL CONDUCT ITS REVIEW OF ASPHALT FUME CARCINOGENICITY SOMETIME WITHIN THE NEXT 2 YEARS (MOST LIKELY)
2. Current classification is 3—not classifiable as carcinogenic to humans (note classification 3 does not say is NOT CARCINOGENIC)
3. Based on the recent studies that have been conducted and reported it is the industry's belief that we are in a good position to maintain the 3 classification
4. IARC's own NCC is powerful component of that

CONCLUSIONS

5. Monitoring of paving workers over the past 20 years have shown that exposures have been low and well controlled and not above the ACGIH recommended maximum of 0.5 mg/m³ of benzene soluble material
6. Even though these data indicate that the paving industry had its house in order, the recent studies further support the industry's position that there is no health risk from asphalt fume exposure

QUESTIONS

